Detailed Project Report (DPR)

Concrete Compressive Strength Prediction (Machine Learning)

By

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Introduction

Thus this project aims to predict concrete strength using machine learning models.

Problem Statement

The quality of concrete is determined by its compressive strength, which is measured using a conventional crushing test on a concrete cylinder. The strength of the concrete is also a vital aspect in achieving the requisite longevity. It will take 28 days to test strength, which is a long period. Thus this project aims to predict concrete strength using machine learning models.

Approach

This project involves data pre-processing like Data cleaning, Exploratory data analysis, Model building and Model deployment. Different models like Linear regression, Lasso regression, Decision tree regression, Random forest regression, Ada boost regression, Gradient boost regression, XGBoost regression and Voting regression were built and then tested on to test data.

Dataset overview

Number of instances: 1030
Number of Attributes: 9
Attribute breakdown 8 quantitative input variables, and 1 quantitative output variable
Missing Attribute Values: None

Given are the variable name, variable type, the measurement unit and a brief description. The concrete compressive strength is the regression problem. The order of this listing corresponds to the order of numerals along the rows of the database.

Name -- Data Type -- Measurement -- Description

Cement (component 1) -- quantitative -- kg in a m3 mixture -- Input Variable
Blast Furnace Slag (component 2) -- quantitative -- kg in a m3 mixture -- Input Variable
Fly Ash (component 3) -- quantitative -- kg in a m3 mixture -- Input Variable
Water (component 4) -- quantitative -- kg in a m3 mixture -- Input Variable

Superplasticizer (component 5) -- quantitative -- kg in a m3 mixture -- Input Variable

Coarse Aggregate (component 6) -- quantitative -- kg in a m3 mixture -- Input Variable

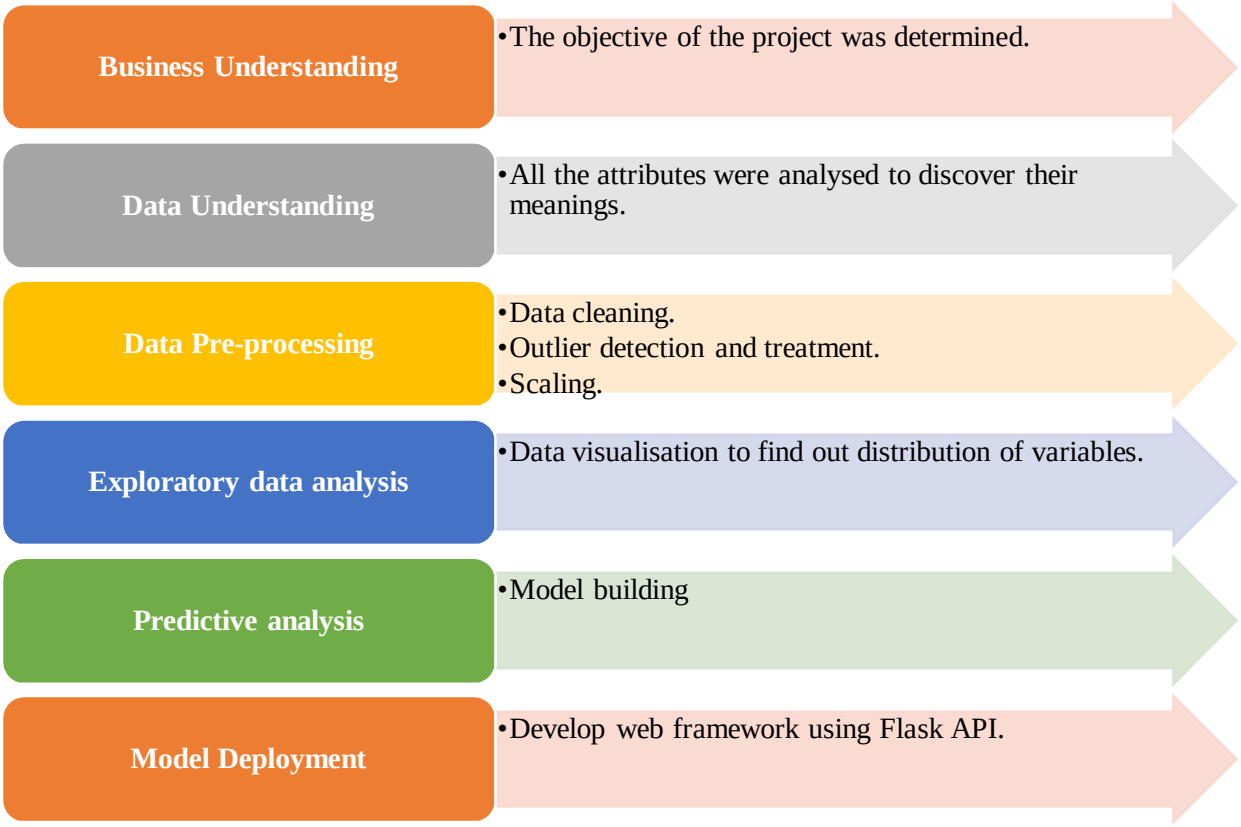
Fine Aggregate (component 7) -- quantitative -- kg in a m3 mixture -- Input Variable

Age -- quantitative -- Day (1~365) -- Input Variable

Concrete compressive strength -- quantitative -- MPa -- Output Variable

User I/O workflow

Design Flow



Conclusion

Out of all the tested models, XGBoost regression resulted in highest R2_score of 92.4635% and low RMSE of 4.787508. Hence XGBoost regression can be used for predicting concrete compressive strength.